

APPENDIX A
REVIEW OF TEST MATERIAL

EXPERT REVIEW OF TEST MATERIAL

This appendix documents and records, to the highest practical level of detail, expert comments on the test material.

All differences noted were typical and expected. For the most part, they would only be noticeable by an expert trained in the observation of television artifacts. The reader is therefore cautioned against over interpretation of the information contained in this appendix.

The comments in TABLE 1 are therefore in no way indicative of the observations made by the non-expert viewers.

Expert review of the test material addressed three separate aspects: the conformance of the test tapes to test criteria, the technical merit of the test tapes, and the appearances of Reference and Test pictures.

Conformance to Test Criteria

The videotape, containing both pseudo-random orders, met the requirements of the master edit-decision list with respect to both content and trial timing.

Technical Merit

A fine diagonal luminance banding was noted on all Reference and Test pictures. The presence of this artifact was traced back to the source tape creation, and results from the NTSC source encoding of 4:2:2 source material. This luminance banding is masked by general luma and chroma noise, and is not visible from the normal viewing distance of 5H except for the picture Mobile and Calendar, where it is somewhat noticeable.

The modulation to IF, upconversion to channel 11 at moderate RF levels, and median receiver demodulation necessarily results in a reduction of signal bandwidth and thus resolution. Low to moderate levels of color smearing also resulted from the NTSC modulation process, affecting Reference and Test sequences equally.

The resulting sequences, as assembled into randomized test tapes, were representative of good quality received NTSC video images.

Appearances of REFERENCE and TEST Cuts

Expert descriptions of the appearances of Reference and Test pictures are given in TABLE 1.

TABLE 1

**Expert Descriptions of Appearances of
Reference (R) and Test (T) Pictures**

| Picture | Reference | Test (DATA ON) | Test (DATA OFF) |
|--------------------------------------|---|--|---|
| Dancing with Wolves (film) | <ul style="list-style-type: none"> contains 5 different scenes, most with fast motion images soft, with mild luma noise mild chroma and luminance fringing very mild diagonal luminance banding some film grain observed | <ul style="list-style-type: none"> slight increase in chrominance noise mild increase in chroma fringing otherwise same as for reference | <ul style="list-style-type: none"> very slight increase in chrominance noise slight increase in chroma fringing otherwise same as for reference |
| Red Rock (film) | <ul style="list-style-type: none"> moderate ringing along vertical edges low to moderate film grain observed some film sparkle noted interlace artifacts along fine horizontal lines very mild diagonal luminance banding | <ul style="list-style-type: none"> slight increase in chrominance fringing slight increase in chroma noise, particularly in road surface passenger side of car takes on a distinctly violet tint overall image is slightly darker otherwise same as for reference | <ul style="list-style-type: none"> very slight increase in chrominance fringing slight increase in chroma noise passenger side of car takes on a slightly violet tint overall image is slightly darker otherwise same as for reference |
| TSN Baseball (video) | <ul style="list-style-type: none"> moderate color smearing along edges of scorecard and sponsor insets, and edges of sails mild ringing along vertical edges dot crawl observed along strong vertical and horizontal edges very mild diagonal luminance banding | <ul style="list-style-type: none"> small increase in chroma fringing, notably along arms of ball player, edges of insets, and sails small reduction in visible detail in spectators slightly darker overall image otherwise same as for reference | <ul style="list-style-type: none"> small increase in chroma fringing along edges of insets, and sails small reduction in visible detail in spectators slightly darker overall image otherwise same as for reference |

| | | | |
|---|--|--|--|
| Bus / Truck (video) | <ul style="list-style-type: none"> • light color smearing along edge of DVC logo, and at edge of blue stripe on bus • cross chrominance visible in lettering on bus • very mild diagonal luminance banding | <ul style="list-style-type: none"> • mild to moderate increase in chrominance fringing • color smearing from stripe on bus takes on a green rather than blue tint • image is slightly darker overall • otherwise same as for reference | <ul style="list-style-type: none"> • slight increase in chrominance fringing • color smearing from stripe on bus takes on a green rather than blue tint • image is slightly darker overall • otherwise same as for reference |
| Flower Garden (video) | <ul style="list-style-type: none"> • mild to moderate cross chrominance in blades of windmill, shingles of roofs, branches of background trees • mild ringing along vertical edges • interlace artifacts along diagonal white rooflines • very mild diagonal luminance banding | <ul style="list-style-type: none"> • mild reduction in chroma detail in flowerbed • mild increase in chrominance fringing • slightly darker overall picture • subtle change in hue where yellows take on a greener tint • otherwise same as for reference | <ul style="list-style-type: none"> • very mild increase in chrominance fringing • slightly darker overall picture • subtle change in hue where yellows take on a greener tint • otherwise same as for reference |
| Mobile & Calendar (video) | <ul style="list-style-type: none"> • moderate color smearing • mild to moderate ringing along luma and chroma boundaries • cross color effects in calendar graphic, and 'hair' of sheep • diagonal luminance banding visible in uniformly colored areas | <ul style="list-style-type: none"> • mild increase in chroma smearing • yellows distinctively become greener • cross color effects somewhat subdued • otherwise same as for reference | <ul style="list-style-type: none"> • mild increase in chroma smearing • yellows distinctively become greener • otherwise same as for reference |

APPENDIX B

PLAYBACK, TEST CONFIGURATION, AND DISTRIBUTION

PLAYBACK AND DISTRIBUTION

This Appendix first describes the playback conditions, then presents simplified block diagrams of the test set-ups used for recording the Parent Master tape and the Playback of the Randomized Sequences. The APPENDIX concludes with a detailed functional block diagram of ATEL's NTSC distribution system.

Playback Notes

At playback, performance of the videotape machine fully met ATEL's criteria for technical merit. No procedural irregularities were encountered.

An audio distortion in Session 3 of Day 1 (3rd iteration of Randomization 1) caused one word to be incomprehensible during the viewer instructions.

Test Configuration

FIGURE 1 summarizes the test setup for the recording of the Parent Master tape, from which the randomized test tapes were derived.

TABLE 2 lists the specific equipment used in the preparation of the Parent Master tape.

FIGURE 2 shows the block diagram of the test setup for the subjective evaluation of the test tapes.

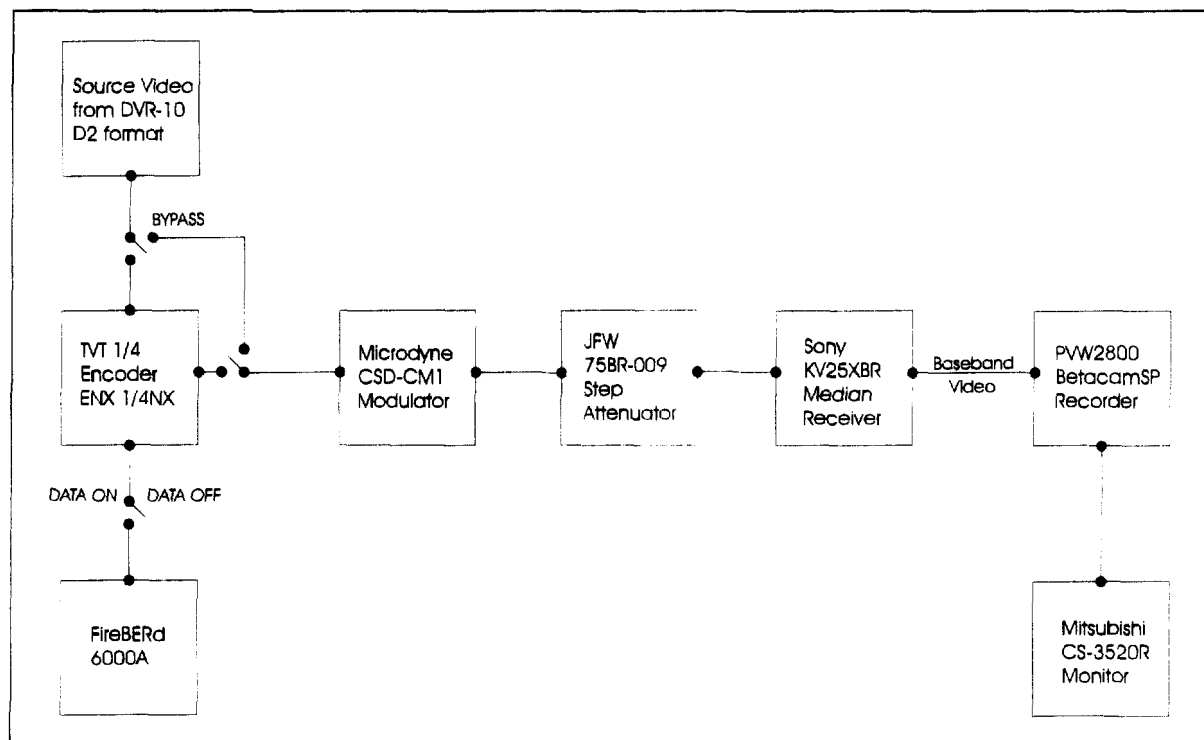


FIGURE 1: Test Setup For Recording the Parent Master Tape

TABLE 2

List of Equipment Used For the Subjective Assessment Project

| MAKE | DESCRIPTION | SERIAL NUMBER |
|-------------------------------------|--|----------------------|
| WavePhore Inc. | TVT 1/4 Encoder model ENX 1/4NX | NX95021303 |
| Telecommunications Techniques Corp. | FireBERd 6000A Communications Analyzer | 03058 |
| Microdyne | RF Agile Modulator model CSD-CM1 | 95002132 |
| Sony | Color TV model KV-25XBR | A213603 |
| Sony | D2 recorder model DVR-10 | 10888 |
| Sony | BetaCam recorder model PVW 2800 | 12133 |
| JFW Industries | Step Attenuator model 75Br-009 | 102781 |
| Mitsubishi | Color TV model CS-3520R | 509933 |
| Tektronix | 1910 REFERENCE Digital Test Signal Generator | B023654 |
| Hewlett Packard | Spectrum Analyzer model 8591A | 3201A02584 |
| Hewlett Packard | Counter/ Power Meter model 5347A | 3009A01188 |

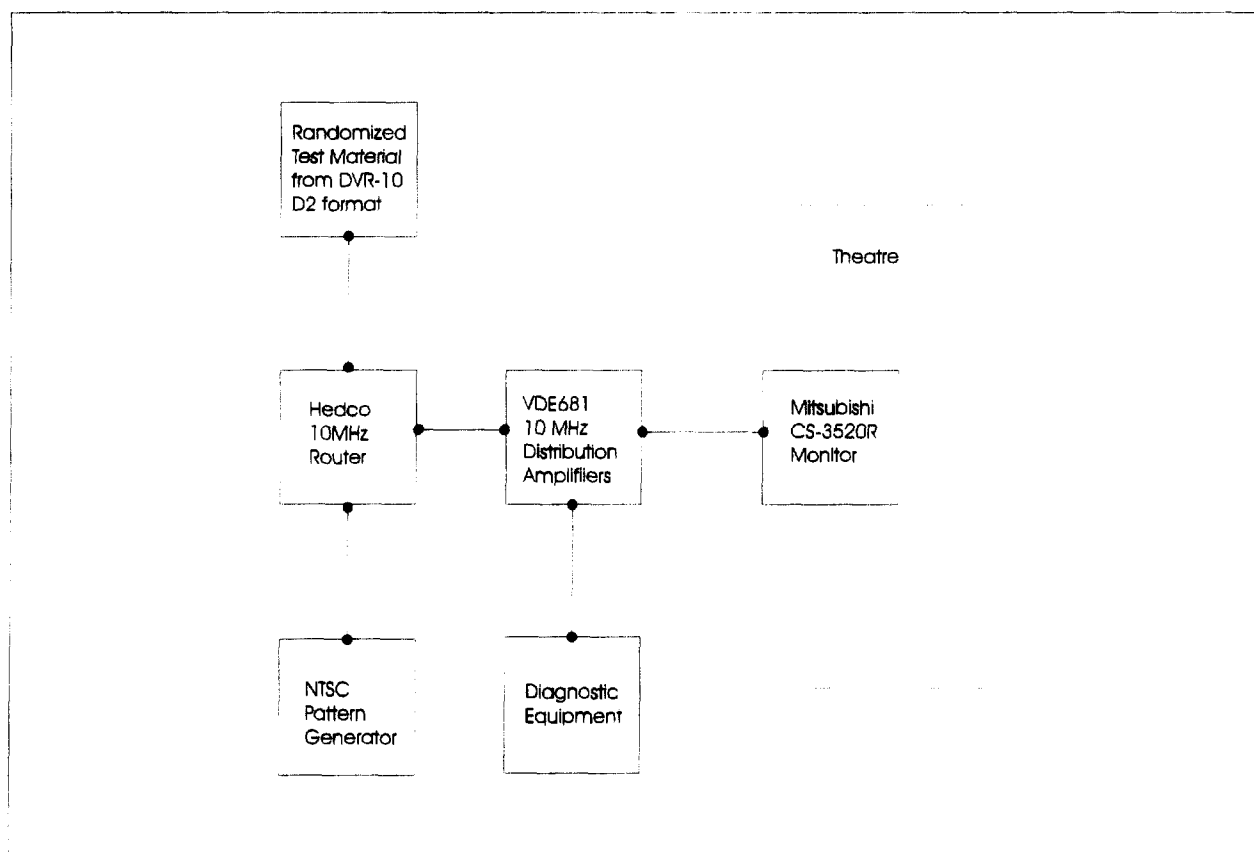


FIGURE 2: Test Setup for the Playback of Randomized Sequences

Distribution System Specifications

During all test sessions the performance of the technical plant was in conformity with the specifications given in TABLE 3. A detailed video functional block diagram of ATEL's NTSC distribution system is presented in FIGURE 3.

TABLE 3

NTSC Source distribution system specifications

| Measurement | Specification |
|--------------------------------|---------------------------------|
| System Gain | < +/- 7mv (referenced to 714mv) |
| Luminance Non-Linearity | < 1% |
| Short Time Distortion | < 1% |
| K2T Distortion | < 1% |
| Chroma / Luma Gain Inequality | < +/- 2% |
| Chroma / Luma Delay Inequality | < 1ns |
| Frequency Response | < 7% at 10Mhz |
| Differential Gain | < 1% |
| Differential Phase | < 1 degree |
| Chroma Non Linear Gain | < 1% |
| Chroma Non Linear Phase | < 1 degree |

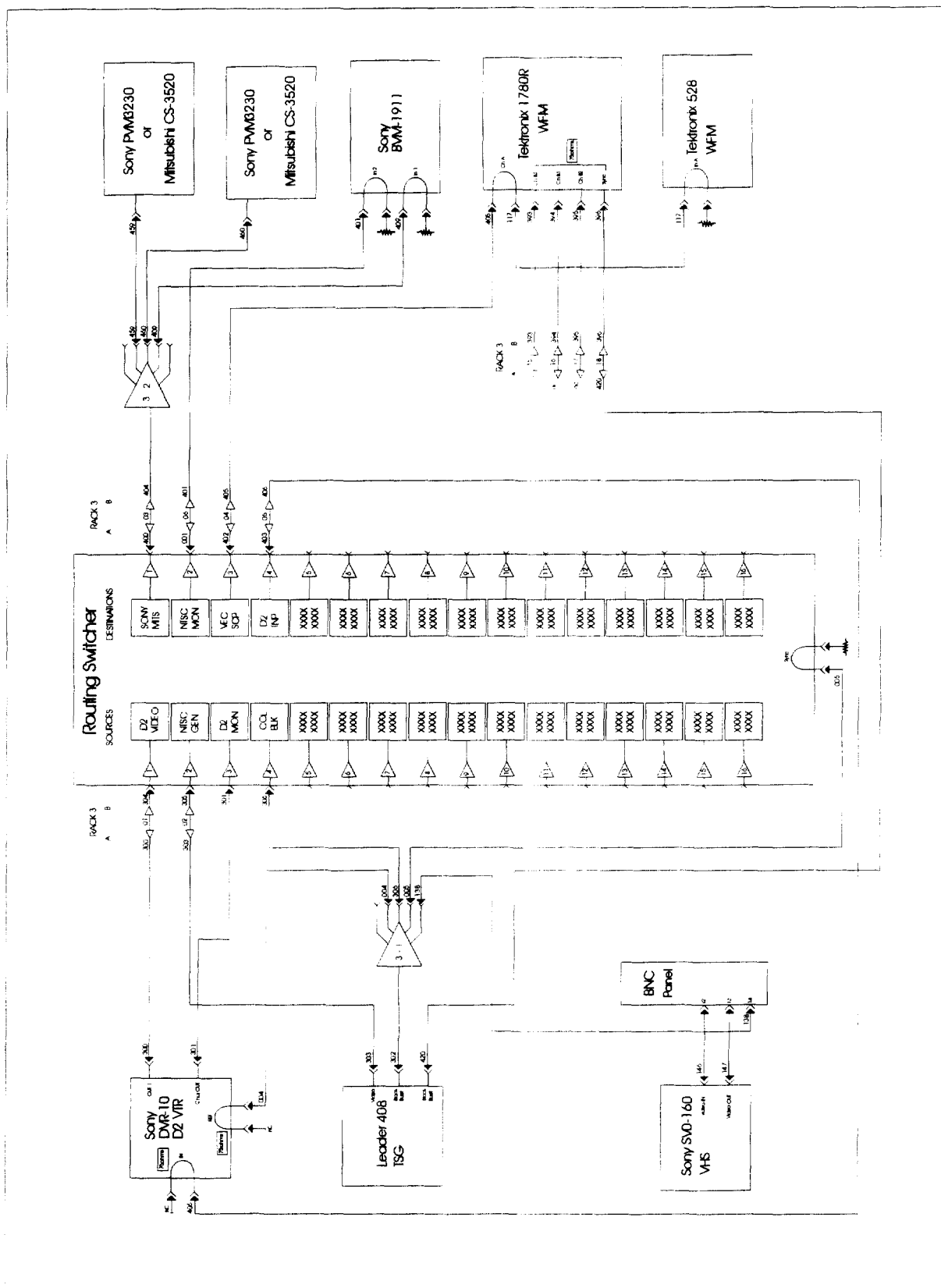


FIGURE 3: NTSC Video Distribution System Functional Block Diagram

APPENDIX C

VIEWING CONDITIONS

VIEWING CONDITIONS

This section describes the viewing conditions, the viewing theater layout, and the lightwall.

Viewing Theater Specifications

During all test sessions, viewing conditions conformed to the specifications given in TABLE 4, NTSC.

TABLE 4

Viewing Conditions For NTSC Subjective Assessments

| Condition | Specification | Maintained Value |
|--|---------------------------|---------------------------------------|
| Peak monitor luminance (PML) | 60 - 80 cd/m ² | 68 - 72 cd/m ² |
| Monitor luminance (maximum, at beam cut-off under ambient lighting conditions) | 2 % of PML | 1.5 - 2 % PML |
| Monitor luminance (maximum, at black-level in dark room) | 1 % of PML | .5 - 1 % of PML |
| Monitor white color temperature | 6500 ^o K | 6400 - 6600 ^o K |
| Luminance of controlled monitor surround | 15 % of PML | 14 - 16 % of PML |
| Color temperature of controlled monitor surround | 6500 ^o K | 6400 - 6600 ^o K |
| Size of controlled monitor surround | not specified | 73 ^o H x 48 ^o W |
| Room illumination | low | 9.5 - 10.5 lux |
| Color temperature of room lighting | 6500 ^o K | 6400 - 6600 ^o K |
| Wall colors | min. color | white/grey |
| Ratio of viewing distance to picture height | 5 - 6 <i>H</i> | 5 <i>H</i> |
| Monitor size | not specified | 35 in |
| Maximum off-center angle of view for individual viewer | 30 ^o | 22 - 24 ^o |

Viewing Theatre Layout

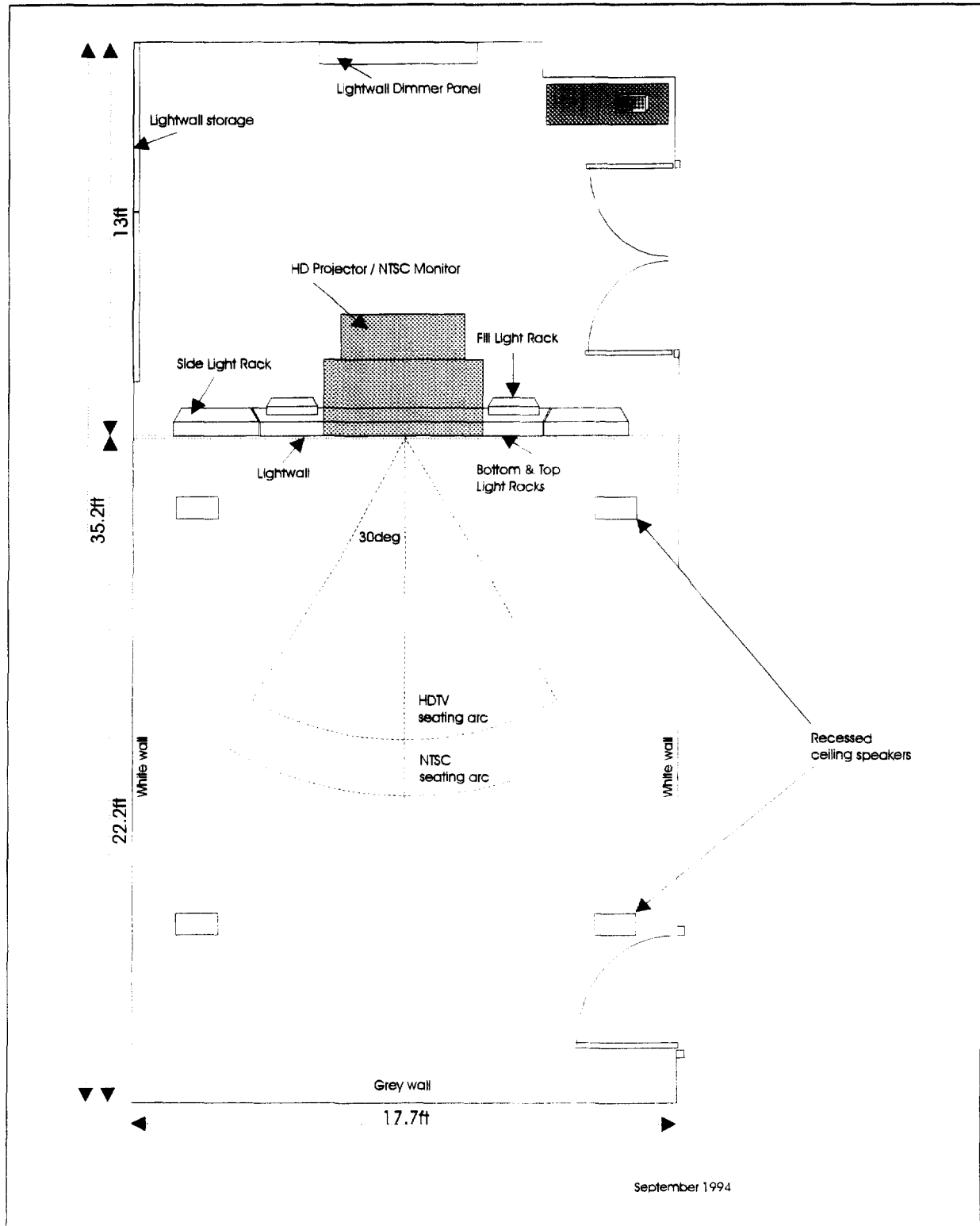


FIGURE 4: Controlled Viewing Environment

Lightwall Diagram

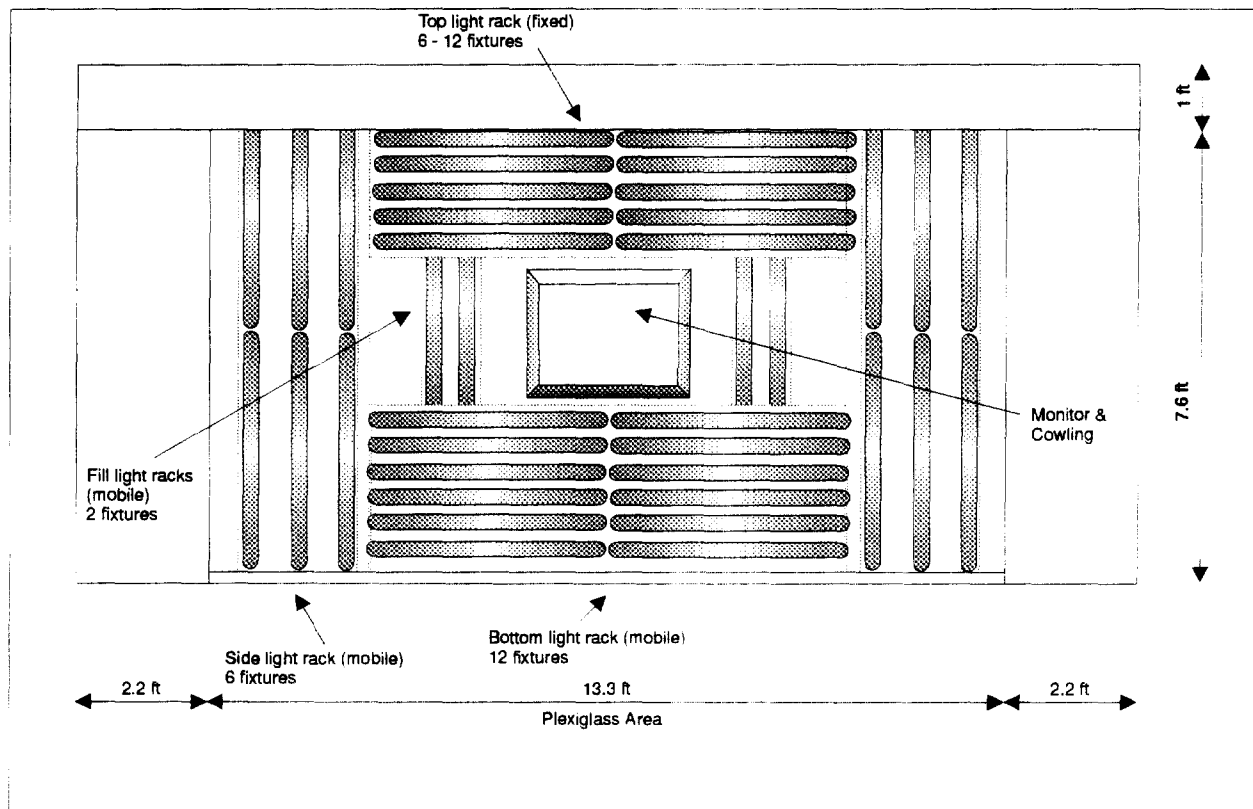


FIGURE 5: Diagram of the Lighting Arrangements for the Lightwall